The Sugar beet

THE SUGAR BEET.

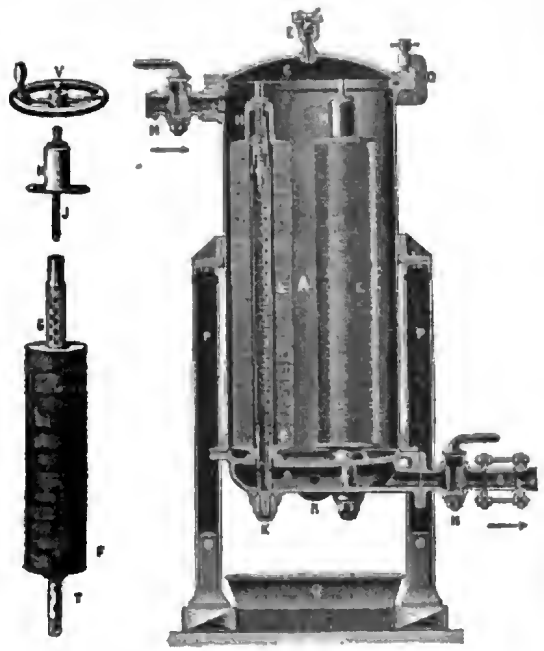
Entered at the Post Office, Philadelphia, Pa., as second-class matter.

Devoted to the Cultivation and Utilization of the Sugar Beet.

TWENTY-THIRD YEAR, No. 11. PHILADELPHIA, NOVEMBER, 1902. { Price, 15 cents / 1 dollar a year

JUICE AND SYRUP FILTRATION.

DURING several phases of the extraction of sugar from beets, there are filtrations of various kinds and, while most of the filters in use give moderately satisfactory results, it is always interesting to follow, within reasonable limits, new combinations that have in view the complete separation of particles in suspension in the juice and syrup being treated. Our attention has recently been directed to what is known as the universal disk filter, shown in the engravings herewith. It may be worked with warm or cold liquor; the washing is rapid; all the liquor in the filter may be drawn off without the necessity for unmounting, and the efficiency is considerable under a small volume. Upon the plate, F, is placed in a vertical position a perforated fluted tube, G; the disks, L, made of a special cotton substance are held tightly against one another by the tightening screw, J, passing through a socket, H, forming part of a second plate, and then into a nut at the upper end of G. By turning the hand wheel, V, any degree of pressure may be obtained. This combination of tube and disks is placed in a sheet or cast iron receptacle, A, the size of which depends upon the number of filtering elements. At the lower extremity of G a perforated tube, T, passes through the compartment, B, outside of the filter proper. The end is closed with a special nut, K. The upper cover, C, of the filter is held in position with a sort of hinged screws, D. The interior pressure may be 7 lbs. without there being the least apprehension of leakage. The juice or syrup to be filtered enters the apparatus through the cock, M, and leaves through the cock, N, into O, which is of glass so as to permit the filtrate to be under constant observation. R is the cock used when washing the filter, and S that for emptying the deposits; this arrangement is shown in the detail engraving, and is adjusted on the section B. E is an air-purging cock. The liquor to be filtered is placed in an upper reservoir at an elevation of at least twelve feet above the filter proper; it enters by M which is gradually opened, falls to the cylinder A, the air escaping through E. When the filter is full of juice or syrup, there being no other opening than through the disks, it finds its passage into G, leaving the portions in suspension upon the filtering medium of the disks. If, after an examination of the filtrate passing through O, it does not seem to be sufficiently clear, the disks must be further tightened, the flow through M must be stopped; and the cover, C, of the apparatus taken off; one or two turns of the hand wheel, V, will give the desired results. When satisfactory results cease, the filter should be taken apart; the cocks, M and N, being previously closed, and the discharge being opened, air will gradually enter by E; the disks are loosened, and taken off to be replaced by fresh ones. One of the essentials in all filters is the possibility of washing without the entire appliance having to be taken apart. Water is introduced through R after the apparatus has been entirely emptied of its contents and the cocks, M and N, being closed. This water will carry off from the cotton disks the deposits previously held, and pass



DETAIL OF CENTRAL TUBE WITH DISK — GENERAL VERTICAL SECTION

Universal Filter

out of the filter. The tube, G, with its disks may be removed and replaced by a new series, under which conditions there is a very little loss of time.

*INFLUENCE OF THE ALKALINITY OF THE SECOND CARBONATATION JUICES UPON THE SOLUBILITY OF MAGNESIA.**

IT has been frequently noticed that in the different compartments of a triple effect, the deposits of the substances contained in beet juices differ. In the first compartment these deposits are rich in silicic acid, calcic carbonate or calcic organic acids. Within what limits can the composition of raw beet juice exert an influence in the formation of the incrustations? When rich in calcic carbonate it is presumable that the juices being evaporated were not clear or that during the third carbonatation there were formed bi-carbonates, which were decomposed by boiling. Under all circumstances it is found desirable during second carbonatation not to allow the alkalinity to fall below a certain limit, so as to avoid redissolving those substances that are not eliminated during third carbonatation. Among these elements may be mentioned magnesia. During the campaign of 1898–1899 an example was given of a *triple effect* being so charged with deposits that it became necessary to wash it with acids every few days. In this special case it was customary in the second carbonatation to leave an alkalinity of 0.03 to 0.04 p.c. in CaO and 0.005 to 0.01 p.c. in the third. The juices upon leaving the third compartment of the apparatus were cloudy and left an abundant deposit when filtered. The analyses for 100 c.c. of juice were as follows:

	Alkalinity		
	CaO gr.	As^2H^2 gr.	MgO
First carbonatation . .	08	0.012	
Second carbonatation .	0.035	0.009	0.0081
Third carbonatation .	0.007	0.007	0.0062

These figures show that the amount of magnesia contained in the juice is greater after the third carbonatation than after the second. The deposits on the filters for 100 dry matter contained 23.09% magnesia. The composition of the juice and the deposits in the triple effect showed beyond doubt that the incrustations were due to the precipitation of magnesia carbonate. It has been proposed, in order to prevent the magnesia from entering the juice, to have a maximum alkalinity of 0.05 to 0.06 p.c. CaO. It was presumed that the alkalinity of 0.035 p.c. would show that all the free lime had been precipitated. The factory that kept to this principle during the entire campaign obtained very satisfactory results. The very careful investigation of Mr. Andrlik demonstrated beyond cavil that upon every occasion when the alkalinity was greater than 0.05 p.c. in CaO the amount of magnesia entering the solution was not more than that contained in a normal *masse cuite*. On the other hand when the alkalinity was less than 0.05 p.c. in CaO, the quantity of magnesia increased in proportion with the decrease of this alkalinity, which apparently shows without doubt that lowering the alkalinity may bring about a solution of the magnesia in cases where the lime used contains a considerable percentage of this element. In the factory under discussion the limestone contained CO^3Ca, 91.9%; CO^3Mg, 7.1%; $A^2O^3 + Fe^2O^3$, 0.5%, which data shows that the limestone in question contained an important excess of magnesia. We consider the foregoing of very great importance in sugar manufacture, for the simple reason that it too frequently happens that chemists connected with factories consider the analysis of limestone from entirely too restricted a point of view, and after the campaign is over they are surprised to find that all has not progressed exactly as was expected; difficulties have arisen that frequently cannot be accounted for. The deposits on the tubes of triple effects or any like evaporating appliance means not only a reduced efficiency of the evaporation, but also a money loss in fuel, for the consumption of coal will have been unnecessarily high. By watching in the laboratory the alkalinity of the juice being treated in the factory, one can be master of the situation as far as magnesia is concerned and thus reduce the chances of the mysteries of the situation.

* The following is a synopsis and free translation of a monograph by M. Andrlik in the *Sucrerie Belge*.—Ed.

ACTION OF SULPHUROUS ACID ON SACCHARINE JUICES.

MANY sugar factories use sulphurous acid in various forms for the decoloration and purification of beet juices, and some important observations have recently been made respecting such modes.* The experiments made were upon diffusion juices, to which 3.5% of lime had been added. The defecation was done at 85° C., and filtration and carbonatation followed until there remained 0.12 alkalinity; the juice was again refiltered, and limed with 0.5% lime, and carbonated for the second time until the alkalinity was 0.05. After heating to 98° C. and filtering, the juice was submitted to the action of sulphurous acid and the conclusions drawn were as follows: The sulphuring has an important influence upon the viscosity and the

* *See C. Ztg.*, 1902.

coloring substances, and boneblack is a more active decolorizer than sulphurous acid. The sulphuring of average juices is more satisfactory than it is with weak juices, the worst results being those where the sulphuring was commenced upon weak juices and the saturation completed with carbonic acid. The sulphuring of weak juices is rational only provided that it follows the carbonatation. The greatest effect is obtained when semi-concentrated juice is sulphured, followed by boneblack filtering. Sulphurous acid has an important influence upon the organic non-sugars. Upon general principles, it may be admitted that the main basis of sulphuring is the decoloration and a reduction of viscosity, with a simultaneous decomposition of the most objectionable non-sugar, mainly the nitric organic non-sugar. As regards the latter, much yet remains to be known. It is suggested that important investigation might be made with the view of determining whether concentration of the juices does not favor the efficiency of the sulphuring. These experiments had still better be tried upon syrups of various densities.

SUGAR REFINING IN THE FACTORY.

THERE is at present a general tendency to conduct the operations of general sugar refining in the factory and thus make the line drawn between sugar extraction from the beet and the handling of raw sugar in special establishments smaller and smaller, and if such conditions continue the two interests will work together. In Germany and Austria, where cartels exist, the refiner holds the situation in his own hands by reason of special money understandings existing between him and the sugar manufacturer. Now and then, in these pages, we give a general out line of the factory refining methods, and a full description of the modified Prangey mode having been sent us, an outline of same is of interest. The mode proper commences only after the *masse cuite* has left the pan. The product is run into vertical receptacles with vertical divisions, which are let down into the drum of large centrifugals. The *masse cuite* after undergoing a certain cooling is purged of its adhering syrup under the influence of the centrifugal force. Two special cleares, saturated with sugar, are made to penetrate through the cakes formed. The cakes are taken out of the forms and submitted to a special drying; they are then sawed into bars and broken to meet the demand of any special market. The new Prangey combination is continuous in its action and consists of three separate parts—a moving metallic band upon which the *masse cuite* becomes more or less solid, a table where it is cut into bars, and another moving table upon which the bars are broken into lumps and then dried. The moving metallic apron upon which the *masse cuite* solidifies is forty-eight feet in length; the thickness of the strip of the product depends upon the height of the distributing hopper from the apron, and its width is regulated by lateral strips. The distributor has a double surface through which steam circulates keeping the mass sufficiently liquid. In the interior are agitators that keep the product thoroughly homogeneous. During its journey upon the apron, it passes over portions that are in communication with a vacuum apparatus where the afterproducts are drawn off, and the purging, etc., then follows. Experience shows that a slight heating is necessary, so that the shape of the bar of sugar will remain constant. The drying appliance is a compartment containing a moving apron, upon which the product is brought in contact with hot dry air. At the end of its journey it is projected upon several circular saws, where it is cut into bars of regular size, which are broken by a special apparatus. As the lumps obtained are more or less plastic, they must be still further dried before being delivered to the consumer. The drying, by means of hot dry air, is, in this case, also done upon moving aprons that have a sort of backward and forward motion, making the lumps occupy an irregular position on the band. Thus no apprehension need exist as to the possibility of the lumps becoming stuck together. The lumps are subsequently placed in boxes and delivered to the trade. These machines can handle ten tons of sugar per diem and the whole working from the commencement to the end demands no special skilled labor.

SALTED BUTTER WITH CHARACTERISTIC BEET ODOR.

IT has been frequently claimed that butter made from milk obtained from beet-fed cows will have a characteristic odor. One of the special bacteriological laboratories of Germany has given the subject special attention, and has examined butter that has been kept in salt water. A species of bacteria has been cultivated which gives to butter the characteristic beet odor; it is known as *Pseudomonus carotæ* and belongs to a group of fluorescent bacilli. It appears to resist a comparatively high temperature. If placed in milk it will multiply and bring about a decomposition. At 85° C., it may be destroyed. It is declared that the only remedy is the pasteurization of the milk, under which circumstances it will yield normal butter.

NEW SUGAR ITEMS.

GENERAL.

France.—From an official document* we learn that during the campaign of 1901–1902 there were 332 factories working, or two less than during the campaign previous. The total of beets sliced was 9,350,852,000 tons, or about 7% more than during 1900–1901. The area cultivated in beets was 704,143 acres. The average yield to the acre was about 13.3 tons, whilst in 1900 the average was 11.2 tons, which was certainly very satisfactory. The total sugar extracted, expressed in refined, was 1,051,931 tons, which is about 11,600 tons more than the year previous. The yield of refined sugar from all sources was about 11.24% as compared with 11.8 the year previous; the difference is small, but in the bulk it amounts to considerable. The largest amount of sugar ever made was during the 1901–1902 campaign. The official statistics before us show that during the last campaign the average beet-sugar factory worked 85 days; this average is slightly below the year previous. The average factory, during 1901–1902, sliced 26,000 tons of beets during the campaign, and about 330 tons per diem. There continues to be a move towards increasing the daily capacity of the sugar-extracting plant, but there remains much to be done before the conditions reach the degree of excellence they should have. The weight of final residuum molasses was 368,611,000 kilos, or about 4% of the weight of the beets sliced. Sugar has never been lower in price than it was during the past year; notwithstanding this fact the consumption per capita is comparatively small and does not appear to increase from year to year; on the contrary, in 1901–1902 it was represented by a total of 432,000 tons, while during 1900–1901 it was 438,500 tons, meaning 6,500 tons less. Strange as it may seem, this decline continues from year to year, and in three years the difference is 32,000 tons. The exportation of sugar from France is not what it should be, considering its superior quality. It amounted to 482,700 tons, expressed in refined, as compared with 688,000 tons the year previous. Here again there is a decline. The stock on hand has been proportionately increased, and in August of this year it was 304,440 tons.

Germany.—We have received the principal data relating to the sugar campaign of 1901–1902. According to the official statistics there were planted in 1901, 1,192,182 acres in beets, which means an increase of about 7.5% as compared with the year previous. The season, taken as a whole, was unfavorable, and notwithstanding this fact the yields per acre were exceptional and averaged 13.5 tons per acre as compared with less than 12 tons during 1900. This fact had a tendency to hasten the commencement of the sugar campaign. The total of beets sliced was 16,000,000 tons or 3,000,000 tons more than the year previous, an increase of over 20%; besides which in the sugar factories, there were worked 20,000 tons of molasses and 153,000 tons of sugar. The total net sugar production was 2,176,800 tons, or over 300,000 tons more than during 1900. The yield of raw sugar was about 13.6% of the total beets worked, as compared with 14% of the campaign previous. The total molasses obtained was 354,400 tons, the yield of molasses was only 2.2% of the beets worked which is very low. In the sugar refineries the melts were 1,064,000 tons raw sugar. The production of white sugar in the refineries was 955,000 tons. In the sugarateries there were obtained 113,000 tons of sugar. If the factories and refineries are considered collectively, there were obtained last year 2,293,000 tons of raw sugar. One characteristic feature to be noted is the increase in the amount of white sugar made. In the sugar factories, this was represented by 283,000 tons, in the sugarateries by 107,400 tons, in the refineries by 955,000 tons, or a total of 1,346,000 tons. Regarding the importation of foreign sugars, it was too small to be worth mentioning. The exportation continued to be on the increase, and amounted to nearly 1,217,000 tons raw sugar; this is an increase of 72,000 tons over 1900. The home consumption does not appear to increase; on the contrary, it was 752,000 tons in 1902 and 768,000 tons in 1900. It would be difficult to give a satisfactory explanation. The stock of sugar, at the end of the fiscal year of 1902, was 553,000 tons. The sugar industry taken as a whole was satisfactory, notwithstanding certain failures and losses.

Austro-Hungary.—Recent data to hand show that there were working during the last campaign 216 factories, or three less than during the campaign previous. The area planted in beets was 906,750 acres, or an increase of 57,000 acres, as compared with 1900. The total weight of beets sliced was 8,490,000 tons against 7,400,000 of the campaign previous. The average yield per acre was 9.2 tons. The factories taken collectively produced 1,291,000 tons of raw sugar, or 18.9% increase over the year previous. The total sugar production was greater than it has ever hitherto been, the extraction being

Indirect Contributions.—Department's data will not agree in all details with data that will be subsequently published. We give this information as we find it.—Ed.

about 15%. While this amount is far greater than in any other European country, the yield of beets per acre being very much less, the one did not compensate for the other. The stock on hand at the end of the fiscal year was 271,000 tons. The quantity of white sugar made is decidedly on the increase; while, during 1901–1902, the total raw sugar production was 1,291,000 tons, there were obtained during 1900–1901, 1,056,000 tons of white sugar. The total raw sugar production was 1,083,000 tons, and 885,000 tons of white sugar were made. The consumption was 351,000 tons, or about 7,000 tons greater than the year previous. The exportation of sugar continues to be on the increase; it was 817,000 tons raw sugar, or 124,000 more than during 1900. The increase in exportation is shown more characteristically by comparing the white and the raw sugar sent out of the country. Of a total of 817,000 tons exported, the white and refined sugars are represented by 705,000 tons, while the raw sugar represents only a very small amount. On the other hand, of a total exportation during 1900–1901 of 693,000 tons, the refined sugar was represented by 545,000 tons.

Other Countries.—We learn from the Argentine Republic that in certain portions of that country, the sugar industry continues to develop in very important proportions. The duty on imported sugar gives the home industry sufficient protection. The annual consumption is 75,000 tons, and the sugar production reached 170,000 tons in 1895. This was followed by the introduction of a cartel, and during 1899, the sugar production fell to 88,000 tons. Certain complications have arisen, and the exportation is now very difficult. As many farmers have for long years been preparing for increased areas devoted to cane, the restrictions as to total sugar manufactured mean less cane to grind; so farmers have been granted some special money allowance for the cane not sold. The prospects for a beet-sugar factory in England are more and more favorable, now that a reasonable duty is granted on the imported beet sugar. In Ireland, many farmers appear to be giving the subject their serious consideration. All over Continental Europe the period of commencing the sugar campaign was very much behind previous years, owing to the lateness of the beet's maturity. In Russia, the total sugar-beet seed used per annum reaches 25,000 tons, a considerable portion being imported; but from the present outlook, the country will be able, ere many years, to meet its home demand, as the industry of seed production is making rapid progress. It appears that Russian farmers claim their own seed to possess exceptional germinating qualities. Foreign speculators, realizing that there is money to be made, have already organized important beet-seed plantations. Russia continues to claim her supposed rights in the question of the international sugar convention. It is pointed out that when the proper time comes, duties will be considerably increased upon products imported from countries who agreed to the Brussels conference; and also that this will have an important influence on the export wine trade from Germany. On the other hand, it is proposed to put an additional duty upon Russian sugars entering the contracting ports; this would demand certain changes in the international agreement. Some interesting information has recently come to hand respecting the sugar industry in Holland; during 1900–1901, there were manufactured 178,000 tons of beet sugar, which means 7,000 tons more than during the previous campaign. The total sugar refined in the country, including both cane and beet, in 1900 was 206,536 tons, or 19,000 tons more than the year previous. There were imported 6,499 tons of refined. The exportation during 1900 was 16,859 tons of raw beet sugar and 117,750 tons of refined, of which the bulk was sent to England. We continue to receive rather contradictory accounts respecting the cane and beet-sugar industry of Spain; during 1901, there were crushed 295,000 tons of sugar cane, yielding 28,000 tons of sugar. Of the forty-eight beet-sugar factories, only one was not working up to the end of 1901. The total beets sliced was 520,439 tons, from which were extracted 38,000 tons of sugar.

SCIENTIFIC DATA.

Beet seed preparation.—A very original mode of preparing beet seed before planting consists in submitting them to a thorough brushing and then to the action of steam during a short period, this being followed by a treatment with concentrated sulphuric acid or any other disinfectant. The brushing has for its main object the removal of any dust and of the portion most attacked by parasites. There are advantages in resorting to this treatment before the vaporization, as the dried seed may be more readily brushed than the moist; furthermore, the brushes do not become clogged with the impurities. The object of the vaporization is to render the mass of seed in a condition that it will rapidly absorb the chemical agents used in the treatment.* **Beet fertilizers.**—One of the leading agronomists recommends that potassic salts of 40% strength be used instead of kainite on all soils where there is any apprehension of their being ruined, through the excessive use of salts

* *Blätter.*

for example, also where there are fears that the fertilizer employed might influence the quality of the resulting beets. When the fertilizer is to be carried a considerable distance the 40% salt becomes of special advantage. Kainite may be used upon light soils. It is pointed out that when the conditions are as they should be as regards quality of the soil and the beet planted, there need be no fear of the potassic salts exerting a pernicious influence (?).* **Nematodes and potassic fertilizers.**—Hollrung, after a very careful examination of the influence of potassic fertilizers upon beets attacked by the nematode, concluded that even with the requisite quantity of potassic plant food the crop of roots was diminished. The sugar percentage of the beets remains nearly normal; but it becomes evident that with such reduced yields to the acre, the total yield of sugar is considerably reduced. Beets that had less potash placed within their reach gave even smaller yields, and the sugar percentage fell from 15 to 8.9%. The beets were so inferior that many of them were worthless. Nematodes appear to offer an important obstruction to the accumulation of potassium in the beet's tissues, and the same may be said of nitrogen. It is thought that the nematodes take up this substance, and bring about a certain elimination, without the beet's being able to absorb all the nitrogen.† **A beet harvester** of a new type has a frame holding the plow, the latter being also held up by two independent supports, which may be held in certain fixed positions, so as to penetrate more or less into the ground. The penetration of the coulter is no longer influenced by the force of the traction, and the centre of connection may be displaced in a lateral direction; furthermore, the harvester may have two coulters.† **Rapid beet unloading** is accomplished in Germany by a new mode, which first of all consists of a large platform turning on a hinge. The railroad cars are pushed on this platform, which is raised by electrical power at one of its extremities, and the slant thus obtained, which is about 45 to 50°, is sufficient to allow all the beets to slide out. They collect in a large hopper placed over a series of cars, and two electrical registers, having rounded extremities so as not to bruise the beets, allow these to fall from the hopper into the cars, which are connected by an underground cable and brought over the beet silos. Four or five men are sufficient to accomplish this work, representing the unloading of 10 to 15 tons of beets per hour. The car is raised in 50 seconds and lowered in 30 seconds. The lifting of a car of 10 to 15 tons capacity, demands 36 horse power; but for average work of 110 tons per hour only six horse power is necessary. In connection with this appliance, there are all the modern safety attachments.* **Beet slice epuration.**—It has recently been suggested that the juice in the beet cells undergoes a certain epuration before being treated in the customary manner. With this idea in view, an attempt is made to utilize the tissue of the cell proper as a filtering medium. To the fresh beet slices, 2% pulverized quicklime is added, and they are then emptied into the diffusors of the battery. The cossettes become white in color and give a pure clear juice, still retaining 0.06% calcic oxide, without pigment. The juice will readily crystallize and the losses are no greater than they are by regular modes. Apparently there is an objectionable feature to this mode—the final residuum cossettes cannot be fed to cattle. Investigations are now being made to determine some mode that would help to overcome this difficulty.* **Residuum cossette pressing** always means important losses in the nourishing value of the product. A leading authority has recently pointed out that these losses depend mainly upon the manner of conducting the diffusion battery, when the temperature in the diffusors is excessive—for example 95 to 100°C. The loss of albuminoids may reach 11%, and when the temperature of the battery is lower the losses in question are very much less. There are certain advantages to be derived from pressing the residuum when hot. It is pointed out that during normal conditions the losses of dry substances represent 2.9% when the final pressed residuum contains 14.9%; but when these dry substances amount to 27%, the losses may reach 8.8%. Evidently all these losses increase with the faulty mode of sugar extraction in the battery. It is concluded that when one wishes to save fuel when final desiccation is the object in view, the pressing can be pushed to any limit without having to fear that the loss of dry matter will be excessive.† **Carbonic acid** in beet-sugar factories is never utilized as economically as it should be. Some of the leading authorities admit that if the gas, after passing through the juice, contains 10% carbonic acid, the operation of carbonatation may be said to have been satisfactory. Experience shows that by the use of well-arranged agitators, the carbonic gas combines more thoroughly with the particles with which it comes in contact. It must be noted that these agitators should revolve slowly, and in most cases it is found desirable to introduce the gas under a slight

*Hervfeld VD. Z. I.

*Centralblatt. 42.

pressure. Some of the leading experts maintain that economy should be practiced in the quantity of coke used in the limekiln, 8% of coke being sufficient. One of the most rational suggestions coming to our notice is that the carbonic acid gas had better be received in a special receptacle before entering the carbonatation tanks. The regularity of the flow into the defecated beet juice may then be kept under control, and the irregularity in the circulation, caused by the varied influence that follows after each stroke of the piston, be obviated. **Limekilns.**—The efficiency of a limekiln in carbonic acid may be increased by injecting into the mass of limestone being burned a mixture of carbonic acid and steam. This mixture cannot, however, exceed a certain temperature; it would wear away the working parts of the blowing engines. With the idea of overcoming this difficulty, the excess of heat of the limekiln gases is utilized to evaporate the water that should be injected into the limekiln. The temperature of these gases would then necessarily fall. The gases are made to circulate through two heat regenerators, depending upon whether it is desired that they shall gain or lose a certain amount of caloric. It becomes possible, under these circumstances, to give to the gases a very uniform temperature.* In order to be able to burn coal in limekilns without there being danger of reducing the purity of the juice with which the resulting carbonic acid gas subsequently comes in contact, an expert adopts the following mode, which consists in forcing the gas obtained from kilns heated with coal mixed with lime, through a small coke oven, or in contact with an incandescent layer of tar substance. All objectionable portions are thus burned, owing to the excess of air contained in the gas. The latter is thus thoroughly epurated and no longer contains elements that would in any way influence the purity of the juice.† **Waste carbonic acid gas.**—After the carbonic acid gas has passed through the defecated juice, it escapes through an upper opening. The question has recently been asked, how much actual carbonic acid gas does this exhaust contain; and this information would be an important indication just to what extent the operation of carbonatation had been effectual. An expert declares that during the first carbonatation, this loss is 35%, and during second carbonatation, 17% of the total gas produced in the limekiln. **Diffusion battery.**—It is recommended to make a diagram of the battery's working under an average condition, so as to be able to conclude the most desirable changes to be made for re-heating during diffusion. This diagram is obtained by the analysis of the juice of the different diffusors that are in full activity. Full allowance must be made for their temperature; but instead of taking all the samples at the same time, it is proposed that the same juice be carefully watched during its passage through the entire battery. The juices during their traject cover a distance greater than that of the battery proper, for the reason that new diffusors with fresh cossettes are continually being added. Under these circumstances one obtains for the temperature a curve entirely different from that of Battot, and with a large number of heated diffusors, the central portion of the diagram is very nearly a straight line. As regards the density of the juice, it has been noticed that it increases mainly at the head of the battery, and it is there where the purity decreases the most, explained by the fact that fresh cossettes have many open surfaces from which the cells of the beet are emptied through a washing, and that it is not dependent upon any diffusion action. Once the diagrams are in hand, one's efforts should be concentrated upon raising the efficiency of the battery by increasing the temperature in most of the diffusors by the use of hot water, and diluting, within reasonable limits, the juice drawn off. All these rules necessarily vary with the local conditions.* **Sand filters** may be cleaned by introducing a central hollow axis with perforated arm attachments. Water is circulated through this axis, escapes through the holes of the arms, and raises the sand to the upper surface where all the impurities separated from the juice are found deposited, and which are carried off by the water. By turning the vertical axis, the arms penetrate the sand more and more, and the grains of the sand filters are thus thoroughly washed.* **A filter** of the Fromme model consists of a box in which are suspended frames and through these the liquor to be filtered circulates. All the frames are in communication with an upper cast-iron compartment through a special conical attachment. Between them are rubber bands which form joints where the frames are compressed one against the other and the outer sides of the box. **Sand filters** have an objectionable feature, which is that the bottom strainer is never sufficiently strong, as it is impossible to make a thick perforated plate. Satisfactory results have been obtained in making the strainer of two gratings, the blades covering the intervals of each. A spacing is maintained between these blades and held in position by a few transverse strips of metal attached between the two gratings. In order to clean these strainers, it is

* *L.* † *D. Z. I.*

* *D. Z. I.*

sufficient to slide one grating on the other. **Centrifugals.**—In order to separate the after-products more thoroughly during the swing-out when working a centrifugal, Classen has obtained some practical results in running into the centrifugals during their filling a certain amount of an after-product of a previous swing-out, taking the precaution, however, of diluting it, so that it will have about the same density as the mother liquor that surrounds the crystals of the *masse cuite*. This added after-product may be warmed or not.* Experience shows that the *masse cuite* worked in a centrifugal with vertical sides tends during its passage from rest to motion to assume a slant corresponding to that which it would have if the entire product were simply emptied upon the floor. If one takes for the axis the perpendicular to the axis of the mass which would pass through its summit, one would thus obtain, in effecting a revolution of one-half of the section of the mass, the inclination assumed in the centrifugal under the influence of centrifugal force applied to this product. In throwing new substances upon any mass, these would slide over the plane already formed. For the same reason the excess of *masse cuite* introduced into a centrifugal would slide off and be thrown outside of the centrifugal if precautions were not taken to arrest this movement at the extremity of the plane. The angle that sugar takes when piled up is that which practical machinists adopt for continuous conical centrifugals. If the slant in question were increased, the result would be that the centrifugal would retain a certain amount of the sugar which had not slid out, and this would become a useless dead weight in subsequent operations. If the slant be excessive, the swing-out motion would tend to carry all the product, an effect too frequently contended with, and for that reason efforts have been made to prevent the sudden escape of the sugar either by the use of a funnel arranged in the interior of the conical centrifugal, or by a ring arranged along the border and representing in reality but a narrow circular opening. These arrangements have given only very secondary results, owing to the difficulty of regulating the width of the opening and consequently the output of that portion of the centrifugal. Furthermore, the very irregular composition of a *masse cuite* is such as to allow it to escape with uniformity on all the filtering surface. There will be necessarily formed a sort of grooves in the mass of sugar from where the *masse cuite* runs off without having had its sugar separated, and the resulting sugar is always very irregular and frequently contains particles of *masse cuite* with its sugar. It is proposed to prevent the too rapid escape of the *masse cuite* by terminating the conical portion with a cylindrical attachment, which would act as a sort of brake. A special device would remove the sugar from the cylindrical portion, and the mass contained in the conical drum would slide off.* The drum of the average centrifugal contains comparatively few holes, and as a result it is only the *masse cuite* that is directly in front of the holes in question that is thoroughly purged of its molasses. This difficulty may be overcome by increasing the number of holes of the drum. The perforations are conical in shape, being larger on their inner than their outer surface, and are so arranged that their borders are all tangent. It is evident under these circumstances that no portion of the inner surface of the drum offers greater facilities for the syrup or molasses to escape than the other. † **Beet-molasses fermentation.**—Up to the present time beet molasses used for distilling purposes is first submitted to an operation called denitration, which by the Barbet mode consists in first diluting the molasses and adding sulphuric acid; then to boil. This operation eliminates the nitric and volatile acids. The new idea consists in preparing pure cultures of an acclimated ferment, capable of resisting all antiseptics contained in the mash of the factory beet molasses. It is proposed to take a certain quantity of molasses, to which is added an equal weight of water and 4 grams per liter of sulphuric acid, and to place this in an alembic and distill until the volume is reduced by four-fifths. This liquid is used, and to it are added, at regular intervals, small quantities of a pure yeast taken from a nourishing sugar mash, the temperature being kept at 20 to 25°C. The small quantity of the initial yeast, of which one liter is sufficient for a large distillery, need alone be acclimated.‡ **Rapid crystallization of after-products.**—In certain factories of Bohemia a mode has been adopted that deserves special mention. The after-products are grained by the usual mode, and run into reservoirs, where they are kept in constant motion through the use of compressed air. This mixing lasts for three days with rich syrups, and about six days for inferior grades. The yield is not much greater than by the usual modes, but the product is more readily worked in centrifugals. The reservoirs in which this agitation is done have a capacity of 210 h.l. (5544 gallons), but they are only partly filled. At 2¼ feet from the bottom is placed the suction pipe, through which the after-product is forced to the top, this motion being

* *D. L. I.*

* *Centralblatt* † *Iles-feld.* ‡ *Comptes Rendus Academie de Science.*

obtained with compressed air. After twenty-four to forty-eight hours, when the lower portions have sufficiently granulated, the operation is repeated through another pipe placed at 4½ feet from the bottom, and this is again continued for one to two days. For a 500 ton factory, the reservoirs mentioned should have a total capacity of 2000 h.l.

Diluting after-products is a subject that has of late been thoroughly examined, and several Austrian experiments have brought to light some important facts worth considering. After the dilution with water the product at once becomes cloudy, and the same change is noticeable under the influence of a special sulphuring. The total precipitation may reach 0.182% of the dry substance; however, in practice, this is seldom more than 0.04 to 0.045. Notwithstanding that this is a very small quantity, it has an important influence upon the purity, and its effect upon the crystallization is very real. The precipitate formed consists of organic salts of lime and iron, silica and fatty substances. Oxalic acid may exist in quantities corresponding to 10 to 20% of the total. Under these conditions the yield may be increased from 3 to 5% by diluting the molasses to 60° Brix. This dilution appears to render the most satisfactory results when handling after-products from raw-sugar refineries.

A steam condenser said to give satisfaction consists of several pulverizators of cold water projecting a cloud of vapor rising rapidly to an upper perforated plate where the water collects, to subsequently fall in the opposite direction as a spray. Under these conditions it is claimed that a minimum volume of water is required to effect a complete condensation of the steam from a quadruple effect.* Another type of condenser receives the water on the first perforated plate, from which it falls as a jet upon a second perforated plate, which divides it as a spray, flowing over the entire length of the condenser. The gases that are not condensed after having passed through this spray are again obliged to circulate through the principal jet between the two plates. Condensers of certain types have an important objectionable feature, which is that the air drawn in by the pump is brought in contact at the last moment with the hot surface of the water. By a new mode a coil is used through which the gases pass before leaving the condenser. The coil in question is placed in a receptacle in which the cold water passes on its way to the condensing tank. The air and water currents circulate in opposite directions, and the air is thus properly cooled, which diminishes the actual work demanded of the air pump.†

*Z † D. Z. I.

A condenser of a new design consists of a vat with rotating troughs for raising water that is emptied into a rotating conical receptacle. Owing to this rotation the liquid rises and is projected as a fine spray through openings connected with the receptacle in a sort of tower, in which is placed this apparatus and where circulates a current of air. Condensers with counter currents frequently allow water to rise above the barometric column and frequently into the triple effect and vacuum pan. The phenomenon occurs mainly in condensers in which the water of injection follows one or more directions in going and coming. For this reason there is always an instant when the water is in equilibrium, that is to say when it no longer tends to rise or fall, and it is possible that the rush of the water to be condensed is sufficient to retain the water, and the result is that it runs into the vacuum pan. The essential cause of this disturbance is yet to be scientifically explained or accounted for. Schwager declares that it is mainly due to the exaggerated manner of working the condensers. It frequently happens that the daily working capacity of a beet-sugar factory is increased, and the condenser remains of the same size as formerly. Another explanation is that the proportions between the pipes is faulty.*

Residuary waters may be satisfactorily epurated by oxidation, as has been practically demonstrated in several beet-sugar factories, where the first operation consists in receiving them in a decanting vat, and the clear water is pumped out and run into the canals for hydraulic transportation; the remaining water is distributed upon the adjoining fields. They are first received in two large cisterns of considerable capacity, one of these being filled with ashes from the boiler, and the other with coke; they are then run into small tanks filled with lumps of coke or rather coarse ashes. These oxidizing cisterns are filled with water twice a day, and the operation lasts from two to four hours in the large cisterns, and three to five hours in the small. By this treatment there remains in the water only about 20 m.g. of nitric organic substance per liter, which means a reduction of 50%. The insoluble organic substances have become soluble, the characteristic beet odor of factory residuary water has been removed, and the sulphuret of hydrogen has been eliminated. It is claimed that the epuration is sufficient to allow fish to thrive, provided it is diluted with five times its volume of river water. Residuary water always contains certain particles in suspension, such as top ends of beets, etc. These may be separated by the use of a suitable horizontal drum, consisting of

*D. Z. I.

strips of wood, the spacing between which becomes greater as they reach the interior. The water passes, but the ends of beets, etc., are retained and are subsequently removed by a suitable scraper. The drum cannot become clogged owing to the special arrangement of the spacing between the strips.* Satisfactory results have also been obtained in emptying all such residues into the tank holding the exhausted residuum cossettes; they are run through the cossette presses, in no manner decreasing the keeping qualities of the cossettes, and one thus obtains one to one and a-half more compressed cossettes. For the epuration of residuary water by the use of chemicals, a series of decanting tanks is used, which follow one after the other, and are placed at different elevations, so that their overflow means a continuous circulation. Transverse bars retain all particles floating on the surface, while those that are precipitated fall to the bottom, which is arranged so that its slant is the opposite to the circulation of the water. **After-products from sugar-ateries.**—After sugar has been extracted from residuum molasses in special factories, by strontia, etc., there remains a wash or after-product that may be used as fuel under the boilers. A German expert recommends that it be previously concentrated to 80° Brix. Beyond this limit the concentration would be a mistake, for the cost of the operation would not find its equivalent during the burning of the residuum. It must be noted that for any exceptional concentration, special evaporating appliances are needed, owing to the viscosity and the excessive frothing contended with. The viscosity prevents the molasses from burning readily, and one is obliged to use a poker constantly, which means the introduction of considerable air over the grate, followed by considerable loss in calories.† **Rations for cattle.**—Standard rations for cattle continue to undergo important changes. It is recommended that for 100 lbs. of corn there should be substituted 17.5 lbs. cotton seed flour and 87 lbs. dried cossettes; for 100 lbs. of bran 24.3 lbs. cotton seed flour and 50.1 lbs. dried cossettes; for 100 lbs. of barley, 16.2 lbs. of cotton seed flour and 76.4 lbs. of dried cossettes, and for 100 lbs. of rice flour, 20 lbs. of cotton seed flour and 82.2 lbs. of dried cossettes. Recent experiments show that sheep eat the dried residuum cossettes, but not with avidity; it would seem that these animals do not like sugar in any form. On the other hand, oxen and cows eat dried cossettes in preference to any other fodder; excellent fattening results have been obtained, and the milk was of an exceptional quality. Horses at first appear to refuse the cossettes, unless they are combined with other forages, after which time they may be readily fed with 1½ kilos per diem. Experience appears to show that 100 kilos of cossettes are about equivalent to 125 kilos of oats. Pigs eat dried cossettes, but they refuse more than 800 grams per diem. Experiments have yet to be made to determine within what limits they should be mixed with water.* **Molasses forages.**—It is claimed that the keeping qualities of a molasses fodder may be increased by mixing it with a so-called animal glue. Under these conditions one may form solid cakes that are very little influenced by the moisture of the air. The inverting tendency of sugar is also considerably decreased. It is proposed first to mix the molasses with the glue, then to heat this mixture to 50 to 70° C. and add the forage; this is dried and subsequently left to cool. Each particle of the forage is then covered with a certain amount of glue that increases its keeping powers. The amount of glue to be used depends upon the quantity of molasses forming part of the combination and the amount of moisture contained in the forage; this may vary from 3 to 15%.† **Residuum cossette drying.**—The Thiesen dryer consists of a large vertical cylinder in which are placed alternately funnels attached to the sides, and a sort of plates or dishes fixed to the axis of the cylinder. Special scrapers are placed on the axis of the dryer, which brush the funnels and force the substance being dried to fall upon the plates, etc. The substance to be dried enters on top and leaves at the bottom of dryer.‡ The Heckmann dryer consists of a large horizontal cylinder closed by a suitable cover with glasses for observation—the progress of the drying can thus be closely watched. In the interior is a series of platforms or shelves, having at their lower portion pipes for heating, which may be lengthened or shortened, as the occasion may demand. A piping on top of the cylinder has for its object connection with the vacuum pump.‡ **Osmosed molasses**, according to Woffmann, may be treated by strontia with the same practical results as is any other beet molasses. The filtration and washing of cakes demand a longer time; but this is not surprising when one considers their smaller percentage of sugar and larger percentage of salt. If one were guided by the composition of the product, it would be concluded that it should be more readily treated than standard molasses, as the organic substances which paralyze filtration are absent.‡

* Z. † D. Z. I.

* Bülter. † Z. ‡ D. Z. I.

THE SUGAR BEET.

LEWIS S. WARE, M. E., *Editor.*

An Illustrated Monthly. $1.00 a year, including postage, for the United States and Canada; $1.25 a year for other countries; single numbers 15 cents. No subscription taken for less than one year.

THE SUGAR BEET CO., Publishers,
15 South Ninth Street, Philadelphia, Pa.

Entered at the post office, Philadelphia, Pa., as second-class matter.

Communications, other than advertisements, should be addressed and checks or money orders be made payable to the order of "THE SUGAR BEET."

Advertisements relating to patent medicines and the like cannot be accepted.

CONTINUOUS CARBONATATION.

WHILE continuous carbonatation has, in a measure, been brought down to a practical basis as far as the double (first and second) carbonatation is concerned, the continuity has never been satisfactory when the single operation of the carbonic acid treatment has been resorted to. In one of our exchanges,* we notice an important discussion upon the subject in which it is claimed that, by adhering to certain practical rules, the operation is perfectly satisfactory. This operation of continuous carbonatation may be conducted in as many compartments as one wishes; it is, however, customary to limit them to two. In the first, the alkalinity should always be less than 0.15, otherwise there would be danger of excessive frothing. If, for one reason or another, the alkalinity is higher, which is made evident when frothing shows itself, the entrance for the juice is closed until the frothing has disappeared. The volume of juice being treated should be as large as possible. In certain Russian beet-sugar factories, the juice is run through the filter presses at ¼ atmosphere where the alkalinity is 0.09 to 0.11, and as soon as the alkalinity increases, there follows an increased pressure up to the limit of three atmospheres. Upon the carbonatation receptacle, there is a pressure gauge, which indicates not only the pressure, but also the alkalinity. It is essential to have the flow of juice into the first carbonatator as regular as possible, which may be accomplished by connecting the lime mixing compartments, so that their respective levels shall be as regular as possible. The emptying of these mixers should be done with regularity. Many advantages are found in having a large horizontal mixer, so as to obviate the variations of level. The advantages of continuous carbonatation are numerous. The number of hands needed for the work is reduced; the juice is clear, as the presses work at a low pressure; and there is an economy in the expense of filtering cloths, etc. We certainly recommend that important experiments be made in continuous carbonatation in American built factories.

* *C. Zu*

FEEDING HORSES WITH SUGAR.

ATTENTION has already been called to the interesting practical experiments of Professor L. Grandeau in feeding horses with sugar, and recently some new data came to hand, a general outline of the arguments and conclusions being given herewith. It has not been many years since the only feed placed at the horse's disposal was the natural farm product, such as hay, grass, straw, and cereals, consisting mainly of oats. With the growth of certain agricultural industries, there nearly always remained a residuary product possessing considerable nutritive value. For long periods of years, cattle breeders knew nothing of the science of substituting one feeding stuff for its equivalent, as regards the nutritive value in substances of which the ration consisted, and even at the present day, the question is not as well known as one might suppose; numerous examples might be given where intelligent specialists insist that for horses nothing can take the place of hay and oats, when work and health are the objects in view. But is not man a striking living example of how food may vary and yet the energy and strength of the consumer be maintained? Men, like animals, when fed with suitable amounts of nitrogenous and non-nitrogenous substances combined in the proper proportions, will form blood, muscle and flesh that do not materially differ. Muscular energy, even when considered alone, is the result of the burning and the destruction of certain elements, regardless of their origin. When considered from this standpoint, the question of animal feeding consists in determining for each case what is needed in nitrogenous and non-nitrogenous substances to meet the special demand of what is asked of it, so that it remains in a healthy condition, at the same time increases in weight, and, if necessary, accomplishes work that may be utilized by man; and furthermore, to combine the ration under the most economical conditions. Professor Grandeau declares that the scientific results obtained in horse feeding on a large scale have been so satisfactory that they should be given an extended appli-

cation. In the army, the statistics for the 126,000 horses of the troop of Paris alone show that their cost of feeding is 28 cents for each individual per diem; this is 12% more than the amount expended for the keeping of horses in well-organized industrial establishments where more work is demanded. The practical experiments upon the Paris omnibus horses were most encouraging in their results. The sugar used polarized 98.5; it was simply added to the regular ration at different periods of feeding during the day. The ration for a horse during moderate hauling was 3.2 kilos corn, 2.5 kilos oat straw and 2.350 kilos sugar; for rapidly going horses, but doing work, 4 kilos corn, 2.5 kilos straw and 2.4 kilos sugar: for trotting, without work, the ration consisted of 2.8 kilos corn, 2.5 kilos straw and 2.4 kilos sugar. It is interesting to compare the co-efficient of digestibility of the former with the new ration:

	Digestibility per 100.	
	Ration: Corn and Straw.	Ration: Corn, Straw and Sugar.
Total organic substances . .	71.95	78 69
Nitrogenous substances . .	61.11	65.99
Cellulose	47.06	55.65
Starch	98.00	97.50
Other substances	16.50	50 40

An examination of this table shows beyond doubt that sugar, far from having a depressing effect upon the digestibility of the organic mass and the essential elements of the ration, on the contrary favored assimilation, notwithstanding the enormous quantity fed—2.5 kilos per diem for 425 kilos live weight (5.5 lbs. for horses weighing 935 lbs.). It is a mistaken idea to suppose that the sugar fed increased the thirst; on the contrary, during these experiments the horses drank 2.1 kilos of water per kilo of dry substanee eaten, while with oats alone the amount rose to 3.4 kilos, and during twenty-two years' observation with various rations, the average has been 2.9 kilos per diem.

ELECTROLYSIS IN BEET JUICE EPURATION.

MANY modes for beet juice epuration by means of electrical currents have been proposed, and in some cases they have been given practical trials; but after the second sugar campaign, they are generally abandoned. Our attention has been directed to a German mode patented some time since that appears to promise a certain future. In this process, basic lead combinations are used. The treatment of saccharine juices by electricity with the view to their epuration does not appear practicable when the acids and alkalies are separated through diaphragms at the same time. The difficulty appears to be in the resistance offered by this filtering medium. If one eliminates only the alkali by electrolysis or by amalgamation at one of the negative electrodes, the current expenditure is of less importance; but by the use of positive electrodes that are not attacked by acids, the acid that is liberated continues to remain in the juice; this difficulty can not be readily obviated by any known mechanical device. One fact is certain, that up to the present time no important beet juice amelioration has been obtained by the use of positive electrodes consisting of soluble metals, such as zinc or lead. The new mode is based upon the separation through electrolysis of the alkalies, and the neutralization of the acid, liberated by their combination, on the positive electrode, consisting of basic oxides of lead or zinc, but mainly of a saccharate of lead simply suspended in the juice. The insoluble non-sugar combinations are separated in their metallic state. It has been noticed that, when the non-sugar lead combinations are mixed with after-products of a sugar factory containing an excess of alkali, there will be certain transformations, resulting in saccharate of lead that may be separated by simple mechanical filtration. A practical example is given by the inventors. They suppose that 0.3% lime is added to a diffusion juice, this subsequently carbonated, then carbonate of lime is added, and the product filtered. The clear juice obtained is mixed with 8 to 10% of its weight of moist saccharate of lead, and is then thoroughly stirred by means of injected air, which is considered the best means of keeping the saccharate of lime in suspension during the operation of electrolysis; furthermore to force the circulation between the two electrodes with a pump. It is claimed that the best positive electrode consists of natural or artificial carbon; for the negative electrode iron plates are used; and parchment paper as a diaphragm. With about one inch spacing between the electrodes, and 8 to 10 volts tension, the intensity of the current at the start is 1½ amperes per square decimeter.* As the operation progresses and the alkali is eliminated by electrolysis the intensity of the current diminishes; as an average for the area under consideration, one ampere appears to be reasonable. The operation is terminated when with a sample of the filtered juice a drop of lead acetate no longer gives a precipitate. The alkaline solution need not be renewed after each operation. In the practical working by this mode, for every cubic meter of juice treated per diem, there is needed ¼ square meter of surface for the electrodes (for 264 gallons

*0.20 sq. decimeters sq. foot.

juice, there is needed 387 sq. inch surface) and 10 H. P. per hour. No invert sugar is formed, and the juice is said to have a purity of 96 (?). To the moist lead combinations of non-sugar, there is added one-fifth of its weight of sugar as an after-product from first and second swing-outs, and two and three times its weight of a normal alkaline solution, diluted to 1½, then mixed and brought to a temperature of about 50° C. It is pointed out that the liquor free of sugar contains non-sugar and lead formed during the electrolysis; this is saturated by carbonic acid. To the residuum, lime is added with the view to regeneration of the alkali. It is claimed that the losses are more than compensated for by the alkali extracted by electrolysis. Whatever may be the advantages of this new mode of purification, we can never recommend a process for practical factory work, depending upon a lead salt in any form, notwithstanding the fact that it may be entirely eliminated in careful laboratory handling. It is sufficient that some phase of the factory manipulation be neglected to considerably endanger public health by innocently introducing the product upon the markets.

CORRESPONDENCE.

Publishers and Editor cannot hold themselves responsible for opinions furnished by correspondents.

FROM CALIFORNIA.

To Editor of Sugar Beet:

The local papers throughout the State continue to discuss the fact that Havemeyer controls interests in fourteen beet-sugar factories of the country. Their total daily capacity permits the slicing of 9000 tons of beets. The San Francisco *Chronicle* in discussing the question says: "Obviously it is cheaper to buy beet-sugar factories, judiciously distributed, for fighting purposes, and fight beet sugar with beet sugar, and not in the name of the refining trust, but under the local name of the factory used for the purpose. That will have the appearance of genuine competition between beet-sugar factories, but the consumers of cane sugar will pay the cost of the fight just the same. When not used for fighting, the investments will pay. These factories will also be used for fighting imported refined sugars when that becomes necessary or desirable. But for the present, in the Eastern markets, cane sugar interests will control the management of all beet-sugar factories controlled by the refining trust." The long-talked-of factory to be located at some place between Tehama and Corning is still seriously discussed. The chances of it assuming some practical shape appear to be more favorable than hitherto as the Northern California Power Company is said to have agreed to furnish the power to run the machinery and pump the water for irrigating the beet lands. Just how the large quantity of steam needed for the various appliances of the proposed beet-sugar factory is to be supplied no mention is made. The exhaust steam from the machinery in all existing plants plays an important role. In the case in question, live steam would take its place. The question remaining to be settled is would this be economical? The Salinas *Index* says: "The beets throughout this section are reported to be turning out better than it was expected that they would and the factory is now running at its full capacity." A gigantic silo will be built on a ranch south of Ventura that will hold at least 10,000 tons of sugar beet pulp from the Oxnard factory. Its construction will be peculiar in that a barranca will be utilized by the building of bulkheads as retaining walls. It is interesting to note that the Oxnard beet-sugar factory has worked in a most satisfactory manner since the sugar campaign commenced; at times over 2000 tons of beets were sliced per diem, the plant having been designed for that limit. An interesting feature of the work was a would-be rivalry between the night and day shifts. A few items taken from the *Courier* are certainly of interest: "On the night shift 1048 tons were sliced, and the day shift 1052 tons * * * most of the sugar leaves the warehouse as soon as sacked." During one week in September nearly 275,000 bags had been sent to Missouri river points. The factory averaged 5500 bags packed per day. The lime rock consumption was 175 tons per diem. The lime rock comes from Rio Grande and Lompoc. The beets sliced at the time of this writing averaged about 16% sugar, with a p. e. of 81. The pay roll of the factory runs from $23,000 to $28,000, exclusive of payments for beets. During one week there were sliced 12,300 tons of beets, from which were extracted 1750 tons of sugar. Last winter there was considerable talk of early winter planting of beets, but unfavorable weather did not give sufficient encouragement and it was not extensively done. The *Courier* says the season is now seeing attempts made at an early planting, and if sufficient wet weather is received there will be beets ready to harvest in May. The Patterson Ranch Company is planting a piece of low land consisting of 50 acres, and will probably put in still more as soon as sufficient rain has fallen. They have been turning over their lands with steam plows since the beets began to be harvested, and have many hundred acres plowed. The campaign at the Chino factory is running along smoothly. Upwards of seventy thousand tons of beets have been sliced with enough yet in the field to keep the factory going until December 1st. The *Champion* says the total yield for the factory is now estimated at 95,000 tons instead of 90,000, as at first thought. Chino farmers are now delivering about 400 tons per day, and that order will continue until the end. Very few of the farmers have siloed any beets, but the company has about 1200 tons in silos. It is thought by the company that it saves the cost of siloing by not being obliged to have beets topped near the close of the harvest, when toppers become scarce and demand higher wages. The Arroyo Grande *Herald* says the yield of sugar beets in the lower end of this valley is something phenomenal. Crops that yield 28, 30 and even more tons to the acre are not uncommon, and in portions of one field 44 tons to the acre were harvested. The contract for the coming season under which it is proposed by the American Beet Sugar Company to secure the coming year's crop of sugar beets does not suit the growers, and unless some modifications are made in it the beet acreage for 1903 will be much less than that of the present season. The trouble is that a cut in price is proposed, and a clause in the new agreement provides that the growers shall pay half the freight from shipping points to place of destination. Four thousand acres of beet land are available in the Bolsa and Westminster districts, but under promised conditions not one quarter that area will be planted. A meeting of the beet growers has been called at Wintersburg to discuss the matter, and at that time a committee will probably be appointed to confer with the sugar company in the hope of securing better terms. The Los Angeles *Times* says: "Considerable interest is mani-

fested over the outcome of the beet-growing contest, which will be determined at the close of the present month. The Union Sugar Company announced last season that they would give a series of prizes to the various sections which produced the largest tonnage of beets per acre. The prizes are as follows: The person growing the largest tonnage of beets per acre on his contracted acreage to be paid fifty cents per ton in addition to the regular contract price; the second largest tonnage, forty cents additional, and the third largest, thirty cents per ton additional. In view of the varying conditions of the soil in different parts of the valley and adjacent territory the prizes are divided into three separate districts, each section being independent of the other. The following rules governed the competition: The Union Sugar Company and its employees are excluded from the contest; each field in competition must be in one solid body; no person can compete for less than ten acres nor on less than eight tons per acre, and for but one prize in each district; beets to be grown according to the condition of the regular contract; the measurement of the ground to be made by an employee of the company in conjunction with the grower; in case of a tie in the competition the grower delivering the richest beets will be entitled to the prize. The season will come to a close about November 1st, there being enough beets on hand to keep the factory going until then. At present the factory is turning out fifty tons of sugar per day, consuming about 500 tons of beets. The season is considered very successful, both from the grower's and factory's standpoint."

In the *Rural Californian* some weeks since was published an excellent article by G. W. Shaw on the question of the beet sugar industry. Many items deserve quoting. A test was made in various parts of the State with the idea of becoming perfectly familiar with all the existing conditions and future possibilities of the beet-sugar industry. "While several dry seasons experienced within the past few years have given the industry something of a set-back in this State, it will ultimately redound to its advantage by impressing upon both factory people and growers that to meet with the most abundant success irrigation must be resorted to. In the localities visited by the writer, Los Alamitos, Chino, Oxnard, Betteravia and Salinas, the one thing which impressed itself of all others was that the beets had not received a sufficient amount of water during the present season. * * * It is safe to say that in the sections visited had the crop received the requisite moisture the tonnage would have been increased one-fourth. In many cases it would have been fully doubled." In regard to irrigation attention is called to the fact that "the methods practiced are generally crude and not well adapted to the production of the highest returns. Certain it is, however, that if California would be sure of a remunerative beet crop, she must turn attention to irrigation—irrigating not only the ground before the planting, but also the growing crop. * * * It is not at all strange to see failures to secure uniform results on fields where no attempt is made to level the land. A *sine qua non* for success in the irrigation of beets is a thorough leveling of the land. Unless this be practiced the plants upon the ridges will suffer from too little water, and those in the depressions from too much, for it is as easy to spoil a beet crop with too much water as with too little. * * * California has some distinct advantages for beet culture over other States, not the least of which is the long planting and growing season, thus lengthening the campaign. * * * Early planting has not been as widely adopted as should be the case. In far too many instances late planting may be stated as a primary cause of partial failure of the crop during the present season. In all cases where the soil has a tendency to dry out, or is of an alkali nature, early planting should be the rule to prevent surface evaporation. * * * The practice of growing beets continuously upon the same soil without a return of any of the plant food removed, will, beyond question, not only reduce the fertility of the land very rapidly, but will also seriously affect its water-holding power, which latter fact is as important as the former in the case of California soils. * * * The early effects of rotation were very clearly shown at Oxnard, where parts of several fields of beets were upon land previously planted to beans. In no case did the writer see a case where the beet crop preceded by beans had not been improved, and in many cases the crop would be fully double on such land.

RIALTO.

SAN FRANCISCO, November, 1902.

FROM MICHIGAN

The recent heavy rains are entirely to blame for the shortage of the beet crop. There was every indication of an enormous yield, but the heavy and frequent falls of water flooded fields and made it impossible to take care of the beets. Some fields are still in such condition that they cannot be entered, the mud and water being too deep. The damage resulting from the spring rains was practically overcome during the summer and early fall, but the late rains reversed the conditions and damaged the crop. An effort will be made to get the beets into piles and covered up before frost comes. Then when the ground freezes over the pits can be uncovered and the beets hauled to the factory. The greatest trouble is in getting men to work in the beet fields when the ground is so wet. Generally the outlook for the sugar campaign this year is not considered very bright, so far as this section of the state is concerned. Careful estimates seem to indicate a two-thirds crop. The Bay City Sugar Company hopes to make its campaign last as long as last year in spite of the crop shortage, as it has under contract 9,500 acres against 6,500 acres last year, thus about balancing the loss of the crop by increased acreage. New machinery has been installed in the drying plant erected here two years ago and it is confidently expected that the process will now prove successful. The German-American Sugar Company made its first run of sugar for this season's campaign October 16th. With the closing of last season's campaign the work of remodeling the factory was started, a lot of new machinery was installed, and at present everything is running satisfactorily. The factory cut 400 tons of beets, and it is believed that this run will be exceeded during the coming week. The raising of sugar beets has invaded Lenawee county. Farmers around Blissfield and Riga put in a few acres as an experiment and are meeting with good results. An important move has been made at Ypsilanti for building a beet sugar factory, the Business Men of the locality have taken hold of the matter; they declare that the work shall not be attempted unless $600,000 is subscribed. A test of the machinery of Sebewaing's factory was made on October 16th, and the regular campaign began a few days later. The first beets delivered were hauled in gaily decorated teams and wagons. Frequent fall rains have done much damage to the light crop of sugar beets in the Saginaw valley. Many fields are under water and the beets are going to decay. Some farmers have quantities of beets pulled, but cannot reach the factories on account of the roads. The plant of the Saginaw Sugar Company has been forced to suspend operations, owing to the fact that all the beets on hand have been run through. The plant of the Valley Sugar Company began operations October 20th. The factory was ready a month ago, but delay in the delivering of beets due to heavy and continuous rains prevented an earlier

start. The Rochester beet-sugar factory began slicing October 13th. As elsewhere, the beet crop has been affected by the backward weather, but a three month's run is expected. The farmers and large feeders in the vicinity are appreciating more each year the value of beet pulp as feed for stock. The Mount Clemens factory is now in operation and has received to date about 3000 tons of beets. The keenest interest is evidenced by the citizens in the enterprise. Oakland county farmers who raised sugar beets this year are greatly pleased over the fact that the percentage of sugar which the beets contain is higher this year than hitherto. Beets shipped to the Rochester factory showed from 14.5 to 14.7%. The highest test made this year was 17.4 Three years ago 12 was considered the average per cent. The Lansing Sugar Company started its factory upon the second campaign of sugar making October 9th. The quality and quantity of the crop is, in spite of the rains, better and larger than that of last year, and the farmers are telling the company that beets this year are their best crop. The company is pleased in every way with the outlook for this year's campaign. Last year's experience has been of great value to the farmers, and beets are being delivered in better shape than last year, when the process of topping was new. The farmers are beginning to appreciate the value of beet pulp and are using it quite readily. The Kalamazoo beet sugar factory started up October 27th. The plant has been thoroughly overhauled and is in excellent condition. Just how long the campaign will last is impossible to decide at this writing, but a record breaking run is anticipated. The beets being received at the Holland sugar factory are testing well, and the plant is running night and day. The crop, however, will fall short of early estimates. A special election will be held December 1st to vote on the proposition of bonding Shawassee county for $10,000 to assist Owosso in securing a site and 8000 acres for two years for an $800,000 beet-sugar factory. The factory will have a capacity of 1000 tons per diem, and be ready by October 15, 1903. The incorporators and stockholders are stockholders of the Pittsburgh Plate Glass Company. Gladstone business men have formed an association to secure the location of a beet sugar factory in their city. The association is hustling for acreage contracts, and meetings are being held in various parts of Delta county. Over 2000 acres of land have been contracted for in Menominee, Marquette and Oconto counties, and, those in a position to know, say a beet sugar factory is assured for Menominee. But few farmers have refused to sign and the agents are meeting with encouragement wherever they go. Beets have been grown in the vicinity of Menominee which ran 19%, and the general average was 16%. The Tawas *Herald* says a committee of business men met with satisfactory results in Detroit, where they went in the interest of a sugar factory. They received from capitalists a written agreement to build a sugar factory at East Tawas upon the securing of 5000 acres of sugar beets from the farmers, and $100,000 worth of stock in the enterprise. The factory is to cost at least $600,000. The committee also secured from the D. & M. Railway Company an agreement to carry beets to the factory for any distance up to 40 miles at 40 cents per ton, and from anywhere on their line at 50 cents a ton. The sugar company also agrees to advance up to $10 an acre on growing beets, according to the condition of the crop to assist the farmer to pay for labor, if desired, to all who contract to raise five acres or more. The $100,000 local capital has already been subscribed and is assured; therefore it is now up to the farmers of this and the adjoining counties to subscribe the acreage and raise the beets. The agitation in favor of the Mason Company has been revived. Certain capitalists have offered $200,000 towards the enterprise, providing that at least $100,000 be obtained in the locality. Cass City inhabitants have of late been again showing some active interest in the question of beet sugar manufacture. The lands of the vicinity are shown to be well suited for beets. There is to be found ample labor for weeding, etc., if the farmers would take up the question of beet cultivation on an extended scale. All that is needed in the way of water, lime stone, etc., are found in abundance.

PINELAND.

BAY CITY, November, 1902.

FROM OTHER STATES.

Washington.—The Waverly factory expects to handle twice the quantity of beets this year as last; the yield to the acre has been higher. The calculated output for this year is 40,000 to 50,000 bags of sugar. The increased yield is explained simply that the farmers bestowed more care upon their crops, and had more experience than at first when they hesitated attempting this special branch of farming. Some farmers will realize a net profit of $35 per acre, or more than the land is worth; the average, however, will not reach $15. As regards this the Spokesman *Review* says: "Nothing succeeds like success, and it is results that the farmer wants. If the entire 2250 acres of sugar beets had been planted to wheat, with an average yield of 30 bushels to the acre, the producers would have realized, at the present price of wheat, 50 cents per bushel, $15 per acre, gross, as against $15 net from the crop of sugar beets." From 12 to 14 carloads of beets of 30 tons each are shipped daily from Tekoa to the factory at Waverly. Their production is becoming a profitable industry in this vicinity. From small beginnings a few years ago, when a few farmers raised small patches as an experiment, large areas have been planted each succeeding year, until now it is not uncommon to see fields of from 20 to 40 acres growing the saccharine vegetable. It is to be regretted that the Waverly factory is not larger, and that they cannot find some means of utilizing their residuum pulp and molasses. A $600,000 beet-sugar factory will be built at North Yakima if the farmers of the Yakima valley will subscribe to $100,000 worth of stock, payable in beets. **Oregon.**—The La Grande *Chronicle* says: "The best 24-hour run yet made was 320 tons. Some difficulty is experienced in handling the product in the last processes, as the per cent. of sugar is higher here than in some other localities. The capacity of the mill is 350 tons in 24 hours, and this amount could easily be cut now if the beets run only 10 per cent. instead of 12 and 14 per cent. The superintendent reports the standard of purity as being up to the average of other years, which is very gratifying to the management, inasmuch as this standard is very high. **Utah.**—The Salt Lake *Tribune* says: "The Utah Sugar Company's Lehi plant is making the most successful run in its history. Not only have all prior records been broken in the output of sugar for a 24-hour run, but the juices are clear and free from troublesome properties, the percentage of extraction is up to the highest mark, and the quality of sugar being produced has never been excelled anywhere. The conditions which contribute to these excellent results seem to be: First, beets ripening in perfect condition; second, machinery and fittings in exact repair at the commencement of the campaign; third, an excellent class of employees to handle the work. The factory is averaging 1000 tons of beets per day being sliced, and all the vast machinery is running like clockwork. The average sugar sacked per day is 2500 bags, or

250,000 pounds. During one 24-hour run 2910 bags were sacked, and this record was maintained for about four days, which certainly established a new record. The farmers have filled the sheds all full with beets, and have been stopped from digging till November 1st, when, in accordance with the contract, all whose beets come up to a certain standard may deliver beets as fast as they wish. At present over 12,000 tons of beets are at the factory awaiting to be made into sugar. Everything is activity at the Logan sugar factory. They are turning out on an average 1000 sacks of sugar a day, and notwithstanding the large quantity of beets consumed daily, the receipts are so heavy that every available foot of storage room is occupied and they have been compelled to slow up on digging for a few days. The season's crop in the valley was estimated at 60,000 tons, but indications now are that it will not exceed 40,000 tons; the continued dry whether is thought to be responsible for the shrinkage in the crop. Hauling beets to the extent of 100 tons per day is what the Utah Sugar Company has done as a beginner for the farmers in the Bear river district. Conditions are very favorable for digging and delivering. Most farmers will plant from two to five times the acreage for next season, claiming it to be the most profitable crop of any undertaken. Of course the question of railroad transportation cuts considerable figure with many in this part of the valley. The fact that storehouses have been built at the factories of this state will considerably help out of certain difficulties hitherto contended with. We are surprised to learn that California beet sugar is able to compete with local beet sugar on the Salt Lake City market at less than $4 per hundred pounds: this competition is the subject of considerable discussion, as the factory is so well managed, we have not the slightest doubt that some way will be found to offer important surprises to the California rival. We are pleased to note that E. H. Dyer & Co. have the contract for building the Garland factory; that it will be up to the usual standard of sugar beet factories this well known firm has built there can be no question of doubt, the company it is said owns 400 acres of land, and contracts for the requisite 4000 acres are being made for 1903. Some time since we noticed the following interesting item in the Salt Lake City *News*: The board of directors of the Utah Sugar Company has decided on issuing all the stock remaining in its treasury to its stockholders at the same rate as the last stock placed, namely, $15 a share. The stock remaining in the treasury of the company amounts to 31,431 shares, and at $15 this would bring into the treasury approximately $471,000 cash, which the company will have need of at once in order to pay for the new 1200 ton factory which is to be installed in the Bear River valley. * * * The first payment of $25,000 had been made to the Dyer Bros. Company of Cleveland, the same firm which had built all the Utah factories up to that time. By the terms of the contract the Dyers are to ship all the machinery and have it in place in readiness for next year's compaign. The company itself will erect the building, and to do this over 1,000,000 bricks will be contracted for, for delivery at the site of the new factory. The exact spot has not yet been located, but will be passed upon by the board within the next few days. It is practically decided, however, that it will be on the west side of the Bear river near the banks of that stream. That the stock will be eagerly subscribed for, there is no question, as the figure at which it will be issued to stockholders is considerably below the market price, the last sales recorded being $17.50. The last issue of treasury stock was made on July 1, 1902, when 20,000 shares were issued at $15 a share, and out of that number only 54 shares remained untaken. The money for the new stock was called for on October 10, 1902, which means that it will participate in the December dividend. The *pro rata* of stock each shareholder will receive is about 18½% of his present holding. * * * Out of the 31,431 shares of treasury stock offered for sale, only 252 shares remained unsubscribed for. This the company is advertising to sell to the highest bidder. When sold it will make the issued capital an even $2,000,000. * * *

Colorado.—"Rumors of a consolidation of several of the sugar factories of the state cannot be verified. They probably originated from from the fact that the same people are interested in several factories and contemplate building others that will extend the scope of their operations. From what can be learned, however, the plan is to operate the factories independently of each other, for the present anyway. The invasion of the Havemeyer people into this state, which was threatened several months ago, would, of course, materially change the situation, but at present local operators are going ahead, enlarging plants and making plans for building new factories, and the prospects for a big output of beet sugar this season are very bright." At Sugar City they feel proud of the fact of having commenced their campaign before other factories of the state; the beets have been of an exceptional quality, testing from 17 to 22%. As the company has 4000 acres of its own cultivation, exceptional care has been bestowed upon the crop; these roots were harvested before those of contracting farmers. This factory is certainly deserving of great credit, and the *Gazette* points out the following: "The company first located on the prairie in Otero County, Colorado, in 1900, where previous to that time the stockman with his cattle disputed possession of the land with antelopes, coyotes and prairie dogs. They found it very hard, indeed, to make up a business requiring such intense agricultural work as raising sugar beets. As a result of their first year's efforts 12,000 tons of beets were raised * * *, the second year 30,000 tons, and the third year 45,000 tons will be obtained * * *. The factory of Sugar City will circulate $500,000, about 60% of which goes absolutely to the farmers and field laborers raising beets. The balance goes to the coal companies, etc." "The plant was built to slice 500 tons per day, and we can slice that many, and even more, but if we tax the slicing capacity, we overtax the diffusors, because this mill is built on the plan of the Eastern mills, where the sugar content is much lower than here, and thereby loose a greater amount of sugar which goes in the pulp. The more beets we slice, less time it gives for diffusion. I do not think that we will attempt to run full capacity. That is, to slice 500 tons * * * The beets here are of such high sugar content that the more time we take to make a high extraction, the better we are off. It will be remembered that our extraction last year was 13½ per cent. * * * It is not the number of tons of beets we slice; the money is at the other end of the factory, where the sugar comes out." Indications point to a most successful season at the Loveland factory. Last season the plant made a great output, but this year the record promises to be broken. There has been a heavy crop of beets and thousands of tons have been treated in the past few weeks. Early in the season there was some loss on account of the rains, but in the last few weeks the beets have recovered much of the sugar lost during the wet weather, and the season promises to be remarkably successful. While a great deal has been said about the beet sugar factories of Colorado and their importance to the state, but few people know anything about the work or realize the magnitude of it. In order that the people interested may become better informed, the managers of the Eaton and Greeley factories have consented to throw the factories open to the public on October 30, and explain fully the process of making beet sugar, showing

everything that is done from the time the seed is received until the sugar is put upon the cars for shipment. The people realizing what the new factories mean to them, have arranged to give a fitting celebration. The Eaton sugar factory started operations October 22 with a full force of men and a good supply of beets on hand. The factory, was built by the Kilby Manufacturing Company of Cleveland, Ohio. It has a capacity for converting about 800 tons of beets every twenty-four hours. To supply this demand the company has under cultivation about 5,000 acres of sugar beets, which, from present, indications, will yield a large tonnage per acre. The main building is 157 x 69, inside measurement, five stories high, built of pressed brick with concrete foundations and floors. The two-story warehouse, 195 x 69 feet, is also of pressed brick with concrete foundations and floors. The immense beet sheds are pits constructed of concrete covered with a building of corrugated iron. This building covers 400 x 190 feet of ground. The whole institution makes a very imposing structure. Everything is lighted by electric lights, both arc and incandescent. The office is a large building to itself, two stories and basement. No better year than the present could have been selected to make a test of the beet crop. It is conceded by farmers all over Weld county that the scarcity of rain and water for irrigation has not been equaled in many years, if, indeed, this season does not break the record for dryness. Notwithstanding this drought, the beet fields look as fresh and healthful as though they had been drenched with rain every day. Another feature illustrating the value of this crop, which also received a thorough test this season, is its hail-proof propensities. While some crops were totally destroyed and others permanently damaged in the great hailstorm of June 27, this year, the sugar beets that were right in the path of the storm were not retarded in their growth at all. In many cases, too, the tops were cut off the roots as clean as though it had been done with a knife, and the earth washed away from around the beet to a depth of many inches. Nevertheless, the long tap root of the beet kept its hold in the ground, and as soon as a cultivator was passed through between the rows and earth again covered the exposed parts, the growth went on as though nothing had happened. New tops soon crowned the roots that so short a time before looked as though completely destroyed, and the ordeal they passed through will not be noticed in the amount of the product this fall. The Greeley factory began cutting beets October 9th. The factory which was constructed at a cost of $650,000 was begun last October. The main building is 270 x 70 feet, four stories high, the rest being two stories. The warehouse is 200 x 70 feet, one story high. There are five water tube boilers of 350 horse power each. The boilers are connected by underground galleries running to the smoke stack outside, which rises 160 feet high, having an interior diameter of nine feet. The beet sheds are south of the main building and each 352 feet long. Two of them store the beets brought by the railroads, the other six being used by the farmers for storage. The factory has its own heating and electric light plant. One hundred and fifty men are employed in and about the factory, much of the work being done automatically by machinery, thus requiring fewer men than in many factories of the same size. Nearly 60,000 tons of beets will soon be in the bins. To work these up into sugar will require three months, during which time the entire force of workmen and the intricate and massive machinery will be employed night and day without a stop. The capacity of the factory is 700 tons of beets per day. The building was constructed by E. H. Dyer & Co., of Cleveland, O., and 150 carloads of machinery alone went into the building. Five thousand acres of beets were contracted for and double this acreage will be secured for next year. This year's experience in cultivating the beet has proven that the beet crop is the only one that can withstand hail, drouth and severe frosts. Indeed, the farmers of Weld county look to the proceeds of their beet crop alone this year as the only remuneration for their season's labor, which means that the 5000 acres raised for the factory represents $270,000. The Fort Collins Sugar Company, capital stock $1,000,000, has been incorporated "to erect and operate beet-sugar factories and raise beets in Larimer, Weld, Boulder, Arapahoe, Jefferson, Morgan, Washington and Logan counties." The factory will have a daily capacity of 1200 tons and will cost $1,000,000. Every known device and every modern scheme for handling beets will be used. Contracts have been made with the farmers near Fort Collins for the product of about 8000 acres, and expect to increase to 12,000. One of the improvements planned in connection with the new factory is the extension of the Colorado & Southern Railroad from Fort Collins, a distance of twelve miles through the beet-sugar country, so that the beets can be loaded into dump cars and transported to the factory. This is said to have been promised by the railroad people in time for the sugar beet campaign of 1903. Two new sugar factories are to be built along the line of the Burlington Railroad in time for next year's crop. The contracts have been signed for the construction of one plant at Fort Morgan and another at Brush, by E. H. Dyer & Co., who have constructed several factories in this state and Utah. Mr. Dyer is expected in Denver next month to begin the work of construction, which will begin either this winter or next spring. The capacity of the plants will be about 600 tons. The manager of the Southern Colorado Land Company is authority for the statement that a beet-sugar factory with a capacity of 600 tons per day, and facilities for doubling the output, will be erected at Alamosa in time to handle next season's beet crop. An unusual feature of the new factory will be the establishment throughout the county of sluicing stations, and the beet juice will be conveyed to the factory by means of pipe lines. The land company has agreed to put sufficient land under cultivation to supply the factory. Fall plowing has been in progress for several weeks. Sugar beets are not an entirely new crop in that portion of the state For some time beet culture has been in vogue and the farmers have met with great success. The production has been more than twenty one tons to the acre in tonnage and an average of over 17 per cent. in saccharine matter. Contracts with the Germans and Russians who have settled on lands belonging to the Southern Colorado Company have been signed for planting 6000 acres in beets for three years. These settlers were brought by the company from Nebraska, Kansas and South Iowa. A contract will shortly be let for the construction of a beet-sugar factory at Windsor. The Colorado Agricultural Company is a recently organized corporation at Rocky Ford. They intend to devote some $50,000 to sugar-beet cultivation on an extended scale; 500 acres have been leased. The Rocky Ford county, taken as a whole, appears to be well suited for beets. Most of those connected with the new company have already had experience in the growing of beets. The sugar factory will certainly derive important advantages from their efforts. The Denver Sugar Land and Irrigation Company has made an important step forward by purchasing 8000 acres of land in Arapahoe and Douglas counties, and a beet-sugar factory is to be built. It appears that most of the stock is held in the state This project would not be complete without the Castlewood dam, by means of which 30,000 acres of land may be irrigated. The company in question proposes to be almost

entirely independent of the latter by growing its own beets. **Kansas.**—For the purpose of inducing Kansas farmers to raise sugar beets, the Santa Fe Railway has invited representative farmers from a number of different localities in the state to take a free trip to Rocky Ford, Colorado, and see for themselves just what the farmers are doing in the sugar beet line. Farmers from Wichita, Newton, Hutchinson and other localities availed themselves of the company's offer. **Nebraska.**—There has been some difficulty in handling beets owing to the rainy season. The Fremont "Sugar Beet Syndicate" is said to have lost some money on this account; however, the 150 acres planted, taken as a whole, were very satisfactory, the beets polarizing on an average 15% sugar. The factory's difficulty was entirely due to not having store houses sufficiently large to keep the plant running for at least a month. The Norfolk sugar factory was set in motion October 4th with a force of 200 men in charge. Last year it worked up 30,000 tons of beets, which quantity, it is expected, will be exceeded this year. The Grand Island is having a satisfactory run, and a campaign of 100 days is looked for. The Elkhorn and Union Pacific roads now find a task in supplying cars for beet growers to transport the products of the fields to the factories. The Elkhorn has converted some stock cars into beet cars and these are being rushed between the factories and the fields as rapidly as possible. **Iowa.**—We are informed that the Sioux Syrup plant is to form part of a beet sugar trust. **Minnesota.** It is to be regretted that efforts of certain local papers should be made to discourage farmers to grow beets. The sugar company has, we are informed, considerable difficulty in securing the quantity of beets to work up a sugar campaign on a proper basis. Where these arguments against beets lack strength is that the surplus labor given to the beet crop is not lost, but is felt in the surplus yield of wheat, etc., that follows in the rotation. When it is asserted that a beet-sugar factory should be located near a populous centre, the reasoning is sound. **Wisconsin.** —Negotiations are being made with the land department of the Wisconsin Central Railroad for sites for beet sugar plants to be built aloog the road's right-of-way in northern Wisconsin. It is reported that the Wisconsin Beet Sugar Company will erect plants at Chippewa Falls and Watertown. Nothing very practical, however, will be done until the Cuban reciprocity issue is entirely settled. Local papers declare that eight beet-sugar factories are to be built in the state with a capital of $500,000. It seems to be forgotten that the amount is sufficient for one factory of a reasonable size and certainly not more than one. **Ohio.**—The Continental Sugar Company's plant at Fremont started up October 15th, with sufficient beets in sight to keep the factory running until January. The beets are quite uniform in size and of a good quality, yielding about ten tons to the acre. The beets are testing 14% sugar. The company is paying $4 50 per ton for beets testing 12% sugar and 80 purity; with 33⅓ cents additional for each per cent. of sugar over that required by contract. Contracts for next year are at the same rate. Farmers are feeding pulp quite freely and consider it quite valuable as a part of the rations. **New York.**—The campaign at the sugar factory started up October 23d. A two-months' run and an output of 5,000,000 pounds of sugar is expected. The Binghampton *Republican* says: "The beet crop has matured slowly this season on account of the wet weather; but reports from all parts of the district indicate that it will be a good crop, with the beets containing a high percentage of saccharine matter. It is the lateness of pulling the beets that has delayed starting the factory over two weeks beyond the ordinary time. Ten to fifteen carloads of beets have been received every day this week, however, and they will continue to come in rapidly now, insuring a sufficient supply to keep the factory running until the close of the campaign. The harvesting of the crop in Yates county is progressing as rapidly as possible with insufficient help. The yield this year is good, averaging about 15 tons per acre, which, at the prevailing price, $5 per ton, will make the crop a profitable one. A large quantity of sugar beets was raised in and about LeRoy. The result has been quite satisfactory and the crop is being harvested. **Canada.**—The Ontario Sugar Co.'s factory at Berlin started on its first campaign October 30th. The erection of the factory was started about six months ago by E. H. Dyer and Co., and cost about $600,000. The capacity is 600 tons of beets per diem. The main building is five stories in height and 325 feet long. The yield of beets in the vicinity of Berlin is about 12 tons to the acre, testing 14 5% sugar. The beets are undersized but of good quality. About 6000 acres are under cultivation, and it is expected the factory will have a crop of about 55,000 tons of beets to grind. It is expected that three other factories—Dresden, Wallaceburg and Wiarton—will be in operation by November 1st. The *Farming World* says: "The beet crop is a remarkably good one for the first season. Not less than 6000 tons of beets are in sight and it is expected that from 10,000,000 to 12,000,000 pounds of sugar will be manufactured this season. The factory is being operated under the personal superintendence of Mr. G. S. Dyer. * * * The farmers who have contracted this year are very well satisfied with the returns from their crop, notwithstanding that the wet weather created an extra amount of labor in keeping down the weeds. There are now 4500 acres under contract for next season's growth and it is expected that at least 7000 will be secured before January 1st. * * * About 30,000 tons of beets will be worked at the Wallaceburg factory. The supply of beets is somewhat disappointing, but the beet crop has fared very much better than most other crops this year, all crops being damaged to a greater or less degree by thewet season." Prof. Harcourt who is in charge of the experimental work at the Guelph Agricultural College recommends the planting of not more than 5 or 10 acres. Some farmers who have put their whole farms under a beet crop have experienced great difficulty it working it. Many of the small experimental plots will run 20 tons to the acre. Letters of incorporation have been granted to the General Distilling Company, limited, recently formed for the purpose of distilling spirits from the by-products of the beet sugar factories. The company has a capital of $600,000. Building operations have already commenced on the plant at Toronto. Some weeks since an important exhibition was held. On the grounds was shown a patch of beets that attracted considerable attention, the different periods of planting permitted object lessons as regards thinning, etc. at the various periods during which the exhibition lasted. The Toronto *Farming World* discussing the exhibit says, "Samples were shown from the six experimental stations conducted by the government * * * there were samples also shown by the four factories * * * the most instructive feature was the typical shaped beet alongside of some of which had been improperly grown, also the method of topping required by the sugar factories. Beets where improperly grown showed fully 30% waste, while those properly grown had only 10%. The exhibition of implements used in the cultivation of the sugar beet also attracted considerable attention. "It is unfortunate that on account of the excessively wet weather that the beet crops generally have suffered. It is, however, pointed out that all facts considered sugar beets prove more

profitable than any other. There will be no difficulty in securing all the beets needed for next campaign. From Alberta we have received some interesting information that would show that all efforts at sugar-beet cultivation in that section have lead to very satisfactory results. The factory that is being built at Saymond will not be ready before 1903, but the plant will be an excellent type of a half-million-dollar beet-sugar factory. Upon general principles it may be admitted the beets cultivated in the vicinity of Brantford, Orangeville, Markham, St. Catharine, and Guelph that were officially analyzed, gave more satisfactory results. E. H. Dyer & Co. have been given the contract for the erection of a beet-sugar factory at Raymond, Alberta, to cost about $500,000, and to be ready to operate October 1, 1903. The agitation for sugar-beet cultivation in Manitoba has commenced on a serious and practical basis. Some years since the question was suggested, but not until now has the question been placed upon a serious basis. To the Winnipeg Board of trade is due the credit of having kept up the interest, and the Department of Agriculture appears to be willing to give the matter its serious attention. It may be remembered that the beet crop in that section during 1900 was unsatisfactory on account of the excessively dry spell. This year's beets were analyzed at the Ottawa Station, but the sugar percentage was not satisfactory; the excessive rains shortly after seeding retarded the roots' development. The tests at Ninga promise to be very favorable. A plant to make syrup is now building. It is pointed out that Selkirk offers special advantages for a factory; water in satisfactory quantities may be obtained there. Other essentials are also within reach. It is pointed out that lands of Manitoba suited for beets may be had for from $10 to $20 an acre. This price compensates in an important measure for the high price of farm labor.

*BOOKS AND PAMPHLETS RECEIVED.**

The Sugar Beet as a Reclaimer of Arid and Alkali Regions, by H. C. Myers.

This pamphlet is written by one who thoroughly understands the subject to which it is devoted. It is declared that "sugar beets thrive where common crops fail absolutely, and besides being a most profitable crop remove alkali from the soil year by year, thereby making ordinary crops possible." Attention is called to the fact that the reclaiming of arid regions means to get rid of the salts in excess. An example is given of the utilization of very poor land. "West Weber, Utah * * * the first step towards reclamation consisted in boring artesian wells * * * the deepest well was used. The presence of nitrates is an advantage in irrigation, as thereby valuable plant food is added to the soil. The soil used had for surface foot the following composition: carbonates, 0.0232 %; chlorides, 0.014 %; nitrates, 0.003 %. Two patches of beets were raised; they contained 14.8% sugar, with purity 81 to 85. The soil, after beet cultivation, had the following composition: carbonates, 0.03 %; chlorides, 0.009 %; sulphates, 0.026 %; nitrates, 0.002 %. The conclusion * * * a limited water supply without drainage has drawn alkali from the second soil foot and carried it to the surface foot; this rising of the alkali occurs during maturity of the beet, and when irrigation ceases * * * Artesian waters of desirable composition are possible for the entire stretch of land from Ogden to Great Salt Lake, and fortunately the more removed these lands are from the mountains * * * the better the artesian waters." As regards this matter, we would say that before any definite conclusions can be arrived at the experiments must continue for a period of years.

The Sugar Content of Different Sections of Beets, by E. C. Post.

The writer is the general manager of the Farmers' Co operative Sugar Beet Company of Dundee, Michigan. The analyses were made by the Bureau of Chemistry of the United States Department of Agriculture, Washington, D. C., the object being to solve a question that has for fifty years been settled in Continental Europe, "Where is the line for proper topping?" The rule evidently depends upon the kind of soil and beet seed used, and must necessarily vary. These experiments were upon beets grown almost entirely beneath ground, those that were partly out of ground, and the last series upon those which were considerably above ground. The conclusion was that in the beets well beneath the surface the crowns contained the same sugar percentage as the root proper. The conclusion drawn from the second series, that when a portion was out of the ground, the rule still held good, would be a dangerous mode to advocate, for the reason that it might produce considerable dissatisfaction among farmers when the manufacturer does not look upon the argument in the same light. As regards the third category, it is declared that "they all had a hollow core in tops, and had a comparatively very low sugar content, not only in the whole beets, but especially in the tops." It seems to us that it does not matter just where such beets are topped, for roots containing 11% of sugar and 76 purity are worthless for sugar manufacture, especially so when the tops enter the average. We notice that a diagram is given showing where such beets should be topped. If manufacturers would accept this as a standard, they would certainly have very impure juices, as it includes a considerable portion of the hollow neck, and they would regret not having insisted upon other conditions. These analyses and arguments render considerable service, and show that Americans are on the road to scientific sugar-beet cultivation.

We have received from the Mauritius Agronomic Station four interesting pamphlets, one of which is their Annual Report for 1900, in which it is declared that notwithstanding the excessively dry season the results of the sugar campaign may be considered very favorable. While the sugar crop in 1895 was 145,000 tons, it ran to 187,500 tons in 1900. The season was a very dry one, and the question of irrigation cannot be considered, for during an excessive drought the rivers, small streams, etc., are dried up. The situation under these circumstances is such that the factories have to stop working for the want of even sufficient water to supply the vacuum pump. Attention is called to the unfortunate conditions of such affairs, as it is just before harvesting the cane that the greatest sugar elaboration occurs.* Certain changes are suggested. The report on the composition of various kinds of canes shows what enormous differences exist, not only in the sugar percentages, but in the amount of plant food taken up from the soil. As the experiments in cultivatiog cane from the seed are very recent, the Bulletin No. 4, devoted to this subject, should be read by those contemplating giving the subject an extended trial.

University of Arizona Agricultural Experiment Station; Twelfth Annual Report.

The portion of the report that may be of interest to our readers is that relating to cattle feeding with sugar beets,

*All books and pamphlets received that relate to our specialty are reviewed, but they have to wait their turn, as our columns are very crowded.—Ed.

*It is to be noted that a dry harvesting season for beets is considered desirable, and in this respect the conditions are just the reverse of those of the Mauritius cane.

Severe storms were contended with which had an important influence upon the resulting butter and fat in the milk, consequently the experiments were not conclusive. It was noticed, however, that the atmospheric influence was very much less upon beet-fed cows than those not having received this special ration.

GLEANED ELSEWHERE.

From *Consular Reports*, we learn that in Peru "The general prosperity of the country may be fairly said to vary with that of the sugar producer. * * * Certainly 40 per cent. is invested in the plantations of cane which occupy the irrigated valleys of the coast. The annual export of sugar is approximately 120,000 tons. In 1899, sugar sold for $2.68 per cwt. f. o. b.; to-day it sells for $1.40. Prior to the fall in price, this exportation at the average price of $2.43 per cwt. produced $5,844,000; to-day that income is reduced to $3,300,300." As to Brazil, the consul writes, that "pursuant to a call issued by the National Society of Agriculture at Rio de Janeiro, delegates assembled to take part in the first sugar producers' convention of Brazil. * * * The subjects were not assigned to delegates, but it was left to the individuals to take whatever part they might wish; and instead of discussing the points outlined on the programme, the convention virtually narrowed down to considering various plans which were proposed to better the condition of those engaged in sugar production. These plans included federal loans to planters; abolition of tax for foreign export and payment of bounty for sugar so sent; a consumption tax on all sugars, the revenue so derived to reimburse the States for the export taxes removed and the bounty established; the storing of sugar by the Government and the sale of same without the intervention of the middleman, etc." The annual sugar production of Brazil is estimated at 250,000 tons; the export to foreign countries in 1900 was about 30,000 tons, and the remaining 220,000 tons were shipped to different states of the Republic; the sugar is subject to an export duty. There are comparatively few factories, and in only one case is the diffusion process employed. The average sugar extractions for the ordinary factory is only 7%. There are two kinds of factories, the central and the small mills. A few houses, especially German, have attempted to concentrate at least a part of the production; but they found difficulties in coming to terms with the factories, and up to the present, nothing definite has been done towards forming a sugar trust. The undertaking, however, is far from impossible; it would require moderate capital, would certainly give large profits and is therefore well worth studying. A syndicate with four agencies at Rio de Janeiro and Campos, Pernambuco and Maceio, Bahia and Aracajo and Sao Paulo, could not only monopolize the Brazilian market, but also the export trade, and thus reunite the numerous scattered forces into a single effort for the general welfare. It is extraordinary that with so considerable a production and consumption of sugar there should be no regular refinery in Brazil. At present the different sugars, raw, crystals, whites, yellows, etc., are generally worked up by small refineries into more or less white powder, which goes by the name of refined sugar in the country. From Germany we learn that "so oppressive have become the exactions of the cartel that the Associated German Chocolate Manufacturers took steps * * * to organize at Genthin, in Brandenburg, a scheme for the erection of a factory capable of working up daily 15,000 centners of beets, the product of which is to be used in their business. * * * Several meetings have been held to discuss plans for reducing the area of beet culture. The principal lesson which American sugar growers have left to study in this country is the intelligent utilization of the two principal waste products of beet-sugar manufacture—the residuum pulp and the molasses * * * for many years, waste beet molasses in this country was either exported to France or Spain or was used here as a raw material for the manufacture of alcohol, the potash salts in that case being recovered and restored to the land as a fertilizer. * * * Germany is a country with limited grazing facilities; vast quantities of corn are imported as food for animals. * * * The home production of meat in this country is and will probably remain far behind the needs of the people. Spent beet pulp enriched with waste molasses helped, therefore, to meet a pressing want." Another report from Magdeburg gives a short account of a steam dryer for residuum cossettes. "The Magdeburg machine produces about 250 kilos (550 lbs.) of dried pulp of an excellent quality per hour. The damp pulp which comes from diffusors with about 90% moisture, is pressed. * * * The amount of steam required is about 600 kilos (1,320 lbs.), per 100 kilos (220 lbs.) of dried pulp. It is hoped that it may be possible to reduce this amount, but there is a definite limit to this reduction." From Copenhagen we learn that the acreage under beet-root cultivation during the year was 30,000 acres producing 398,000 tons of beets, or about 13 tons per acre. The total receipts for the year were $876,695 and the bonus to beet growers amounted to $148,606.

The American Consul at Coburg declares that in "1898 Spain imported 748,724 lbs. of sugar, but in 1899 this importation fell to 20,346 lbs.," and the outlook at present is that the sugar importation from foreign countries has now ceased. The Consul's report from Germany gives a terse translation, taken from the *Nachrichten für Handel und Industrie*, a synopsis of which is of interest, for it relates to the sugar question in Japan. "The efforts of the Japanese Government to promote beet-sugar production upon the island of Yezzo have been without results. * * * The native production of sugar in Japan has notably decreased in the last few years—from 7,247,402 lbs. in 1893 to 2,703,000 lbs. in 1897. According to the official journal 240,922,645 lbs. of sugar were used in all Japan in 1890, while in 1897 the consumption amounted to 325,994,594 lbs. The import of foreign sugar was for 1890, 173,673,000 lbs., valued at $6,869,000, for 1893, 214,855,484 lbs., valued at $7,156,000, for 1897, 581,972,651, valued at $9,854,728 and for 1898, 581,972,651, valued at $13,510,000. The import of refined sugar in 1898 was 365,950,600 lbs. Up to the year 1895, the import of refined sugar was almost exclusively in the hands of the refiners of Hong-Kong. In 1897 the import of refined sugar from Hong-Kong reached the value of $5,318,000, and in 1898 it was valued at $7,000,000. In 1895 German import firms began sending refined beet sugar to the Japanese market, * * * In the year 1899 a syndicate of twenty-seven manufacturers was formed in Austro-Hungary to open the markets of Japan for their products. * * * There are two refineries one of which is in Osaka with a capital of $750,000, half of which is deposited. The machinery was brought from England and the production capacity is some 200,000 lbs. daily. The other company is located in Tokyo, with machinery imported from Germany and a working capital originally of $300,000. For enlarging and improving this, it is proposed to increase the capital to $1,000,000. * * * The native refined sugar is not coarse grained, but fine and costs 25 to 30 cents more than German sugar.

In the *Treasury Decisions* are some more important facts relating to sugar, of which we give a general outline herewith. The new law respecting Russian sugars went into effect

afterFebruary 14, 1901. There is also a long discussion respecting raw sugars imported from France in 1897. It was declared that no bounty was paid on the export of that sugar, and that the liquidations were not final, but that the reliquidations against which protests were filed * * *" It is declared that "the protests were untimely, not having been filed within ten days from the dates of the original liquidations; second, that these applicants having admitted such liquidations to be final, they cannot now assert that the liquidations were the liquidations contemplated. * * * The application of the Franklin Sugar Refining Company is denied." We notice some facts relative to the export bounties on sugar produced in the Netherlands. "The following net amounts of the bounties paid or bestowed by the Government of the Netherlands on the export of sugars produced in that country are hereby declared for the assessment and liquidation of additional duties: On raw sugar produced from beet roots 1.38 florins per 100 kilos of hard refined; on sugar refined from imported raw sugar, 0.19 florin per 100 kilos in addition to bounty, if any, allowed on the raw sugar by the country of production; on sugar refined from beet root raw sugar produced in the Netherlands 1.57 florins per 100 kilos."